ACKNOWLEDGMENTS

We would like to thank all of the subjects who donated their time and biological samples to be a part of this study.

This work was supported in part by the Intramural Research Programs of the National Institute of Neurological Disorders and Stroke (NINDS), the National Institute on Aging (NIA), and the National Institute of Environmental Health Sciences both part of the National Institutes of Health, Department of Health and Human Services; project numbers Z01-AG000949-02 and Z01-ES101986. In addition this work was supported by the Department of Defense (award W81XWH-09-2-0128), and The Michael J Fox Foundation for Parkinson's Research. This work was supported by National Institutes of Health grants R01NS037167, R01CA141668, P50NS071674, American Parkinson Disease Association (APDA); Barnes Jewish Hospital Foundation; Greater St Louis Chapter of the APDA; Hersenstichting Nederland; Neuroscience Campus Amsterdam; and the section of medical genomics, the Prinses Beatrix Fonds. The KORA (Cooperative Research in the Region of Augsburg) research platform was started and financed by the Forschungszentrum für Umwelt und Gesundheit, which is funded by the German Federal Ministry of Education, Science, Research, and Technology and by the State of Bavaria. This study was also funded by the German National Genome Network (NGFNplus number 01GS08134, German Ministry for Education and Research); by the German Federal Ministry of Education and Research (NGFN 01GR0468, PopGen); and 01EW0908 in the frame of ERA-NET NEURON and Helmholtz Alliance Mental Health in an Ageing Society (HA-215), which was funded by the Initiative and Networking Fund of the Helmholtz Association. The French GWAS work was supported by the French National Agency of Research (ANR-08-MNP-012). This study was also funded by France-Parkinson Association, the French program "Investissements

d'avenir" funding (ANR-10-IAIHU-06) and a grant from Assistance Publique-Hôpitaux de Paris (PHRC, AOR-08010) for the French clinical data. This study was also sponsored by the Landspitali University Hospital Research Fund (grant to SSv); Icelandic Research Council (grant to SSv); and European Community Framework Programme 7, People Programme, and IAPP on novel genetic and phenotypic markers of Parkinson's disease and Essential Tremor (MarkMD), contract number PIAP-GA-2008-230596 MarkMD (to HP and JHu). This study utilized the high-performance computational capabilities of the Biowulf Linux cluster at the National Institutes of Health, Bethesda, Md. (http://biowulf.nih.gov), and DNA panels, samples, and clinical data from the National Institute of Neurological Disorders and Stroke Human Genetics Resource Center DNA and Cell Line Repository. People who contributed samples are acknowledged in descriptions of every panel on the repository website. We thank the French Parkinson's Disease Genetics Study Group and the Drug Interaction with genes (DIGPD) study group: Y Agid, M Anheim, A-M Bonnet, M Borg, A Brice, E Broussolle, J-C Corvol, P Damier, A Destée, A Dürr, F Durif, A Elbaz, D Grabil, S Klebe, P. Krack, E Lohmann, L. Lacomblez, M Martinez, V Mesnage, P Pollak, O Rascol, F Tison, C Tranchant, M Vérin, F Viallet, and M Vidailhet. We also thank the members of the French 3C Consortium: A Alpérovitch, C Berr, C Tzourio, and P Amouyel for allowing us to use part of the 3C cohort, and D Zelenika for support in generating the genome-wide molecular data. We thank P Tienari (Molecular Neurology Programme, Biomedicum, University of Helsinki), T Peuralinna (Department of Neurology, Helsinki University Central Hospital), L Myllykangas (Folkhalsan Institute of Genetics and Department of Pathology, University of Helsinki), and R Sulkava (Department of Public Health and General Practice Division of Geriatrics, University of Eastern Finland) for the Finnish controls (Vantaa85+ GWAS data). We used genome-wide association data generated by the Wellcome Trust Case-Control Consortium 2 (WTCCC2) from UK patients with Parkinson's disease and UK control individuals

from the 1958 Birth Cohort and National Blood Service. Genotyping of UK replication cases on ImmunoChip was part of the WTCCC2 project, which was funded by the Wellcome Trust (083948/Z/07/Z). UK population control data was made available through WTCCC1. This study was supported by the Medical Research Council and Wellcome Trust disease centre (grant WT089698/Z/09/Z to NW, JHa, and ASc). As with previous IPDGC efforts, this study makes use of data generated by the Wellcome Trust Case-Control Consortium. A full list of the investigators who contributed to the generation of the data is available from www.wtccc.org.uk. Funding for the project was provided by the Wellcome Trust under award 076113, 085475 and 090355. This study was also supported by Parkinson's UK (grants 8047 and J-0804) and the Medical Research Council (G0700943). We thank Jeffrey Barrett for assistance with the design of the ImmunoChip. DNA extraction work that was done in the UK was undertaken at University College London Hospitals, University College London, who received a proportion of funding from the Department of Health's National Institute for Health Research Biomedical Research Centres funding. This study was supported in part by the Wellcome Trust/Medical Research Council Joint Call in Neurodegeneration award (WT089698) to the Parkinson's Disease Consortium (UKPDC), whose members are from the UCL Institute of Neurology, University of Sheffield, and the Medical Research Council Protein Phosphorylation Unit at the University of Dundee. S.L. is funded by the Medical Research Council (G1100643).

We would like to thank the NINDS sponsored Neurogenetics Repository hosted by Coriell Cell Repositories for the use of both case and control samples.

Dr. Guerreiro was supported in part by a fellowship from Alzheimer's Research UK.

The work performed by the North American Brain Expression Consortium (NABEC) was supported in part by the Intramural Research Program of the National Institute on Aging, National Institutes of Health, part of the US Department of Health and Human Services; project number Z01 AG000932-04. In addition this work was supported by a Research Grant from the

Department of Defense, W81XWH-09-2-0128. This study utilized the high-performance computational capabilities of the Biowulf Linux cluster at the National Institutes of Health, Bethesda, Md. (http://biowulf.nih.gov). This work performed by the UK Brain Expression Consortium (UKBEC) was supported by the MRC through the MRC Sudden Death Brain Bank (C.S.), by a Project Grant (G0901254 to J.H. and M.W.) and by a Fellowship award (G0802462 to M.R.). D.T. was supported by the King Faisal Specialist Hospital and Research Centre, Saudi Arabia. Computing facilities used at King's College London were supported by the National Institute for Health Research (NIHR) Biomedical Research Centre based at Guy's and St Thomas' NHS Foundation Trust and King's College London. We would like to thank AROS Applied Biotechnology AS company laboratories and Affymetrix for their valuable input. This work was also supported by National Institutes of Health grants NS050487 (Clark),

NS060113 (Clark) and NS036630 (Marder) ,2UL1 RR024156 (Marder) and the Parkinson's Disease Foundation (Clark/Marder).

This work has also been made possible by the kind support of The Michael J. Fox Foundation for Parkinson's Research with additional support from Cure Alzheimer's Fund (CAF), Prize4Life, the National Alliance for Research on Schizophrenia and Depression (NARSAD), and EMD Serono (to Lars Bertram). Christina M. Lill has been supported by the Fidelity Biosciences Research Initiative. Haydeh Payami was supported by National Institutes of Health R01-NS-36960.

This study was supported by the Parkinson's disease foundation (PDF) (GX, HH)

We would like to thank Mark Gaskin for help with sample organisation and aliquoting.

This study was supported in part by Research Committee, University of Thessaly (code 2845;

PI: GMH). We would like to thank Maria Dardioti for help with sample organisation and aliquoting.

This study was supported by the Parkinson's disease foundation (PDF) (GX, HH). This study was supported by the Parkinson's disease foundation (PDF) (CS). This study was supported in part by Research Grant "Sinergasia" awarded to LS from the Hellenic Secretariat of Research and Technology, as well as a Research Grant from GlaxoSmithKline Greece.

This work was supported by the National Heart, Lung and Blood Institute's Framingham Heart Study (Contract No. N01-HC-25195) and its contract with Affymetrix, Inc for genotyping services (Contract No. N02-HL-6-4278) This study was also supported by grants from the National Institute of Neurological Disorders and Stroke (NS17950) and the National Institute of Aging (AG08122, AG16495, AG033193, AG031287, P30AG013846, and AG025259) and an unrestricted grant to the Framingham study from the Bumpus foundation.

Cardiovascular Health Study: This CHS research was supported by NHLBI contracts

HHSN268201200036C, HHSN268200800007C, N01HC55222, N01HC85079, N01HC85080,

N01HC85081, N01HC85082, N01HC85083, N01HC85086; and NHLBI grants HL080295,

HL087652, HL105756 with additional contribution from the National Institute of Neurological

Disorders and Stroke (NINDS). Additional support was provided through AG023629 and

P30AG024826 from the National Institute on Aging (NIA), 1K23NS070867 (NINDS), and

1KL2RR024154 (National Center for Research Resources). A full list of CHS investigators and institutions can be found at http://www.chs-nhlbi.org/pi.htm.

The provision of genotyping data was supported in part by the National Center for Advancing Translational Sciences, CTSI grant UL1TR000124, and the National Institute of Diabetes and Digestive and Kidney Disease Diabetes Research Center (DRC) grant DK063491 to the Southern California Diabetes Endocrinology Research Center.

Funding was obtained through the Internationaal Parkinson Fonds, Netherlands Consortium for Healthy Aging, Netherlands Organization for Scientific Research (NWO), Netherlands
Organization for Health Research and Development (ZonMW), Research Institute for Diseases in the Elderly (RIDE)

The Oxford Brain Bank is supported by grants form the Medical Research Council (OA), Brains for Dementia Research (Alzheimer Brain Bank UK) (OA) and in part by the National Institute for Health Research (NIHR) Oxford Biomedical Research Centre based at Oxford University Hospitals NHS Trust and University of Oxford (OA). The views expressed are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health. LP is supported by the Discovery Award from Parkinson's UK.

CONSORTIUM MEMBERSHIP

IPDGC consortium members and affiliations: Mike A Nalls (Laboratory of Neurogenetics, National Institute on Aging, National Institutes of Health, Bethesda, MD, USA), Vincent Plagnol (UCL Genetics Institute, London, UK), Dena G Hernandez (Laboratory of Neurogenetics, National Institute on Aging; and Department of Molecular Neuroscience, UCL Institute of Neurology, London, UK), Connor Edsall (Laboratory of Neurogenetics, National Institute on Aging), Noah Nichols (Laboratory of Neurogenetics, National Institute on Aging), Manu Sharma (Department for Neurodegenerative Diseases, Hertie Institute for Clinical Brain Research, University of Tübingen, and DZNE, German Center for Neurodegenerative Diseases, Tübingen, Germany), Una-Marie Sheerin (Department of Molecular Neuroscience, UCL Institute of Neurology), Mohamad Saad (INSERM U563, CPTP, Toulouse, France; and Paul Sabatier University, Toulouse, France), Javier Simón-Sánchez (Department of Clinical Genetics, Section of Medical Genomics, VU University Medical Centre, Amsterdam, Netherlands), Claudia Schulte (Department for Neurodegenerative Diseases, Hertie Institute for Clinical Brain Research), Suzanne Lesage (INSERM, UMR_S975 [formerly UMR_S679], Paris, France; Université Pierre et Marie Curie-Paris, Centre de Recherche de l'Institut du Cerveau et de la Moelle épinière.

Paris, France; and CNRS, Paris, France), Sigurlaug Sveinbjörnsdóttir (Department of Neurology, Landspítali University Hospital, Reykjavík, Iceland; Department of Neurology, MEHT Broomfield Hospital, Chelmsford, Essex, UK; and Queen Mary College, University of London, London, UK), Sampath Arepalli (Laboratory of Neurogenetics, National Institute on Aging), Roger Barker (Department of Neurology, Addenbrooke's Hospital, University of Cambridge, Cambridge, UK), Yoav Ben-Shlomo (School of Social and Community Medicine, University of Bristol), Henk W Berendse (Department of Neurology and Alzheimer Center, VU University Medical Center), Daniela Berg (Department for Neurodegenerative Diseases, Hertie Institute for Clinical Brain Research and DZNE, German Center for Neurodegenerative diseases), Kailash Bhatia (Department of Motor Neuroscience, UCL Institute of Neurology), Rob M A de Bie (Department of Neurology, Academic Medical Center, University of Amsterdam, Amsterdam, Netherlands), Alessandro Biffi (Center for Human Genetic Research and Department of Neurology, Massachusetts General Hospital, Boston, MA, USA; and Program in Medical and Population Genetics, Broad Institute, Cambridge, MA, USA), Bas Bloem (Department of Neurology, Radboud University Nijmegen Medical Centre, Nijmegen, Netherlands), Zoltan Bochdanovits (Department of Clinical Genetics, Section of Medical Genomics, VU University Medical Centre), Michael Bonin (Department of Medical Genetics, Institute of Human Genetics, University of Tübingen, Tübingen, Germany), Jose M Bras (Department of Molecular Neuroscience, UCL Institute of Neurology), Kathrin Brockmann (Department for Neurodegenerative Diseases, Hertie Institute for Clinical Brain Research and DZNE, German Center for Neurodegenerative diseases), Janet Brooks (Laboratory of Neurogenetics, National Institute on Aging), David J Burn (Newcastle University Clinical Ageing Research Unit, Campus for Ageing and Vitality, Newcastle upon Tyne, UK), Gavin Charlesworth (Department of Molecular Neuroscience, UCL Institute of Neurology), Honglei Chen (Epidemiology Branch, National Institute of Environmental Health

Sciences, National Institutes of Health, NC, USA), Patrick F Chinnery (Neurology M4104, The Medical School, Framlington Place, Newcastle upon Tyne, UK), Sean Chong (Laboratory of Neurogenetics, National Institute on Aging), Carl E Clarke (School of Clinical and Experimental Medicine, University of Birmingham, Birmingham, UK; and Department of Neurology, City Hospital, Sandwell and West Birmingham Hospitals NHS Trust, Birmingham, UK), Mark R Cookson (Laboratory of Neurogenetics, National Institute on Aging), J Mark Cooper (Department of Clinical Neurosciences, UCL Institute of Neurology), Jean Christophe Corvol (INSERM, UMR_S975; Université Pierre et Marie Curie-Paris; CNRS; and INSERM CIC-9503, Hôpital Pitié-Salpêtrière, Paris, France), Carl Counsell (University of Aberdeen, Division of Applied Health Sciences, Population Health Section, Aberdeen, UK), Philippe Damier (CHU Nantes, CIC0004, Service de Neurologie, Nantes, France), Jean-François Dartiques (INSERM U897, Université Victor Segalen, Bordeaux, France), Panos Deloukas (Wellcome Trust Sanger Institute, Wellcome Trust Genome Campus, Cambridge, UK), Günther Deuschl (Klinik für Neurologie, Universitätsklinikum Schleswig-Holstein, Campus Kiel, Christian-Albrechts-Universität Kiel, Kiel, Germany), David T Dexter (Parkinson's Disease Research Group, Faculty of Medicine, Imperial College London, London, UK), Karin D van Dijk (Department of Neurology and Alzheimer Center, VU University Medical Center), Allissa Dillman (Laboratory of Neurogenetics, National Institute on Aging), Frank Durif (Service de Neurologie, Hôpital Gabriel Montpied, Clermont-Ferrand, France), Alexandra Dürr (INSERM, UMR S975; Université Pierre et Marie Curie-Paris; CNRS; and AP-HP, Pitié-Salpêtrière Hospital), Sarah Edkins (Wellcome Trust Sanger Institute), Jonathan R Evans (Cambridge Centre for Brain Repair, Cambridge, UK), Thomas Foltynie (UCL Institute of Neurology), Jing Dong (Epidemiology Branch, National Institute of Environmental Health Sciences), Michelle Gardner (Department of Molecular Neuroscience, UCL Institute of Neurology), J Raphael Gibbs (Laboratory of

Neurogenetics, National Institute on Aging; and Department of Molecular Neuroscience, UCL Institute of Neurology), Alison Goate (Department of Psychiatry, Department of Neurology, Washington University School of Medicine, MI, USA), Emma Gray (Wellcome Trust Sanger Institute), Rita Guerreiro (Department of Molecular Neuroscience, UCL Institute of Neurology), Clare Harris (University of Aberdeen), Jacobus J van Hilten (Department of Neurology, Leiden University Medical Center, Leiden, Netherlands), Albert Hofman (Department of Epidemiology, Erasmus University Medical Center, Rotterdam, Netherlands), Albert Hollenbeck (AARP, Washington DC, USA), Janice Holton (Queen Square Brain Bank for Neurological Disorders, UCL Institute of Neurology), Michele Hu (Department of Clinical Neurology, John Radcliffe Hospital, Oxford, UK), Xuemei Huang (Departments of Neurology, Radiology, Neurosurgery, Pharmacology, Kinesiology, and Bioengineering, Pennsylvania State University – Milton S Hershey Medical Center, Hershey, PA, USA), Isabel Wurster (Department for Neurodegenerative Diseases, Hertie Institute for Clinical Brain Research and German Center for Neurodegenerative diseases), Walter Mätzler (Department for Neurodegenerative Diseases, Hertie Institute for Clinical Brain Research and German Center for Neurodegenerative diseases), Gavin Hudson (Neurology M4104, The Medical School, Newcastle upon Tyne, UK), Sarah E Hunt (Wellcome Trust Sanger Institute), Johanna Huttenlocher (deCODE genetics), Thomas Illig (Institute of Epidemiology, Helmholtz Zentrum München, German Research Centre for Environmental Health, Neuherberg, Germany), Pálmi V Jónsson (Department of Geriatrics, Landspítali University Hospital, Reykjavík, Iceland), Jean-Charles Lambert (INSERM U744, Lille, France; and Institut Pasteur de Lille, Université de Lille Nord, Lille, France), Cordelia Langford (Cambridge Centre for Brain Repair), Andrew Lees (Queen Square Brain Bank for Neurological Disorders), Peter Lichtner (Institute of Human Genetics, Helmholtz Zentrum München, German Research Centre for Environmental Health, Neuherberg, Germany), Patricia Limousin (Institute of

Neurology, Sobell Department, Unit of Functional Neurosurgery, London, UK), Grisel Lopez (Section on Molecular Neurogenetics, Medical Genetics Branch, NHGRI, National Institutes of Health), Delia Lorenz (Klinik für Neurologie, Universitätsklinikum Schleswig-Holstein), Steven Lubbe (Department of Clinical Neurosciences, UCL Institute of Neurology), Alisdair McNeill (Department of Clinical Neurosciences, UCL Institute of Neurology), Catriona Moorby (School of Clinical and Experimental Medicine, University of Birmingham), Matthew Moore (Laboratory of Neurogenetics, National Institute on Aging), Huw R Morris (MRC Centre for Neuropsychiatric Genetics and Genomics, Cardiff University School of Medicine, Cardiff, UK), Karen E Morrison (School of Clinical and Experimental Medicine, University of Birmingham; and Neurosciences Department, Queen Elizabeth Hospital, University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK), Ese Mudanohwo (Neurogenetics Unit, UCL Institute of Neurology and National Hospital for Neurology and Neurosurgery), Sean S O'Sullivan (Queen Square Brain Bank for Neurological Disorders), Justin Pearson (MRC Centre for Neuropsychiatric Genetics and Genomics), Joel S Perlmutter (Department of Neurology, Radiology, and Neurobiology at Washington University, St Louis), Hjörvar Pétursson (deCODE genetics; and Department of Medical Genetics, Institute of Human Genetics, University of Tübingen), Pierre Pollak (Service de Neurologie, CHU de Grenoble, Grenoble, France), Bart Post (Department of Neurology, Radboud University Nijmegen Medical Centre), Simon Potter (Wellcome Trust Sanger Institute), Bernard Ravina (Translational Neurology, Biogen Idec, MA, USA), Tamas Revesz (Queen Square Brain Bank for Neurological Disorders), Olaf Riess (Department of Medical Genetics, Institute of Human Genetics, University of Tübingen), Fernando Rivadeneira (Departments of Epidemiology and Internal Medicine, Erasmus University Medical Center), Patrizia Rizzu (Department of Clinical Genetics, Section of Medical Genomics, VU University Medical Centre), Mina Ryten (Department of Molecular Neuroscience, UCL Institute of Neurology), Stephen Sawcer

(University of Cambridge, Department of Clinical Neurosciences, Addenbrooke's hospital, Cambridge, UK), Anthony Schapira (Department of Clinical Neurosciences, UCL Institute of Neurology), Hans Scheffer (Department of Human Genetics, Radboud University Nijmegen Medical Centre, Nijmegen, Netherlands), Karen Shaw (Queen Square Brain Bank for Neurological Disorders), Ira Shoulson (Department of Neurology, University of Rochester, Rochester, NY, USA), Ellen Sidransky (Section on Molecular Neurogenetics, Medical Genetics Branch, NHGRI), Colin Smith (Department of Pathology, University of Edinburgh, Edinburgh, UK), Chris C A Spencer (Wellcome Trust Centre for Human Genetics, Oxford, UK), Hreinn Stefánsson (deCODE genetics), Francesco Bettella (deCODE genetics), Joanna D Stockton (School of Clinical and Experimental Medicine), Amy Strange (Wellcome Trust Centre for Human Genetics), Kevin Talbot (University of Oxford, Department of Clinical Neurology, John Radcliffe Hospital, Oxford, UK), Carlie M Tanner (Clinical Research Department, The Parkinson's Institute and Clinical Center, Sunnyvale, CA, USA), Avazeh Tashakkori-Ghanbaria (Wellcome Trust Sanger Institute), François Tison (Service de Neurologie, Hôpital Haut-Lévêque, Pessac, France), Daniah Trabzuni (Department of Molecular Neuroscience, UCL Institute of Neurology), Bryan J Traynor (Laboratory of Neurogenetics, National Institute on Aging), André G Uitterlinden (Departments of Epidemiology and Internal Medicine, Erasmus University Medical Center), Daan Velseboer (Department of Neurology, Academic Medical Center), Marie Vidailhet (INSERM, UMR S975, Université Pierre et Marie Curie-Paris, CNRS, UMR 7225), Robert Walker (Department of Pathology, University of Edinburgh), Bart van de Warrenburg (Department of Neurology, Radboud University Nijmegen Medical Centre), Mirdhu Wickremaratchi (Department of Neurology, Cardiff University, Cardiff, UK), Nigel Williams (MRC Centre for Neuropsychiatric Genetics and Genomics), Caroline H Williams-Gray (Department of Neurology, Addenbrooke's Hospital), Sophie Winder-Rhodes (Department of Psychiatry and

Medical Research Council and Wellcome Trust Behavioural and Clinical Neurosciences
Institute, University of Cambridge), Kári Stefánsson (deCODE genetics), Maria Martinez
(INSERM UMR 1043; and Paul Sabatier University), Nicholas W Wood (UCL Genetics Institute;
and Department of Molecular Neuroscience, UCL Institute of Neurology), John Hardy
(Department of Molecular Neuroscience, UCL Institute of Neurology), Peter Heutink (Department
of Clinical Genetics, Section of Medical Genomics, VU University Medical Centre), Alexis Brice
(INSERM, UMR_S975, Université Pierre et Marie Curie-Paris, CNRS, UMR 7225, AP-HP,
Pitié-Salpêtrière Hospital), Thomas Gasser (Department for Neurodegenerative Diseases, Hertie
Institute for Clinical Brain Research, and DZNE, German Center for Neurodegenerative
Diseases), Andrew B Singleton (Laboratory of Neurogenetics, National Institute on Aging).

Additional contributing investigators from the Laboratory of Neurogenetics, National
Institute on Aging, National Institutes of Health.

Alan E. Renton, Noah Nichols, Janet Brooks, Sampath Arepalli, Hannah Pilner, Chris Letson, and Bryan J. Traynor

PSG-PROGENI Investigators and Coordinators

Albany Medical College: S Factor, D Higgins, S Evans; Barrow Neurological Institute: H Shill, M Stacy, J Danielson, L Marlor, K Williamson; Baylor College of Medicine: J Jankovic, C Hunter; Beth Israel Deaconess Medical Center: D Simon, P Ryan, L Scollins; Beth Israel Medical Center: R Saunders-Pullman, K Boyar, C Costan-Toth, E Ohmann; Brigham & Women's Hospital: L Sudarsky, C Joubert; Brown University (Memorial Hospital of RI): J Friedman, K Chou, H Fernandez, M Lannon; Cleveland Clinic Florida-Weston: N Galvez-Jimenez, A Podichetty, K Thompson; Clinical Neuroscience Center: P Lewitt, M DeAngelis; Colorado Neurological Institute: C O'Brien, L Seeberger, C Dingmann, D Judd; Columbia University Medical Center: K

Marder, J Fraser, J Harris; Creighton University: J Bertoni, C Peterson; Evanston Northwestern Healthcare: M Rezak, G Medalle; Hotel-Dieu Hospital-Chum: S Chouinard, M Panisset, J Hall, H Poiffaut; Hunter Homes McGuire Veterans Medical Center: V Calabrese, P Roberge; Indiana University School of Medicine: J Wojcieszek, J Belden; Institute For Neurodegenerative Disorders: D Jennings, K Marek, S Mendick; Johns Hopkins University: S Reich, B Dunlop; London Health Sciences Centre: M Jog, C Horn; Mayo Clinic Jacksonville: R Uitti, M Turk; McFarland Neurosciences: T Ajax, J Mannetter; Medical College of Georgia: K Sethi, J Carpenter, B Dill, L Hatch, K Ligon, S Narayan; Medical College of Wisconsin: K Blindauer, K Abou-Samra, J Petit; Medical University of Ohio: L Elmer, E Aiken, K Davis, C Schell, S Wilson; Mount Sinai School of Medicine: M Velickovic, W Koller (deceased), S Phipps; North Shore-LIJ Health System: A Feigin, M Gordon, J Hamann, E Licari, M Marotta-Kollarus, B Shannon, R Winnick; Northwestern University: T Simuni, A Videnovic, A Kaczmarek, K Williams, M Wolff; Ochsner Clinic Foundation: J Rao, M Cook; Ohio State University: M Fernandez, S Kostyk, J Hubble, A Campbell, C Reider, A Seward; Oregon Health & Science University: R Camicioli, J Carter, J Nutt, P Andrews, S Morehouse, C Stone; Ottawa Hospital Civic Site: T Mendis, D Grimes, C Alcorn-Costa, P Gray, K Haas, J Vendette; Pacific Neuroscience Medical Group: J Sutton, B Hutchinson, J Young; Saskatoon Dist Health Board Royal Univ Hosp: A Rajput, A Rajput, L Klassen, T Shirley; Scott & White Hospital/Texas A&M University: B Manyam, P Simpson, J Whetteckey, B Wulbrecht; The Parkinson's & Movement Disorder Institute: D Truong, M Pathak, K Frei, N Luong, T Tra, A Tran, J Vo; Toronto Western Hospital, University Health: A Lang, G Kleiner-Fisman, A Nieves, L Johnston, J So; UMDNJ-School of Osteopathic Medicine: G Podskalny, L Giffin; University of Alabama at Birmingham: P Atchison, C Allen; University of Alberta: W Martin, M Wieler; University of Calgary: O Suchowersky, S Furtado, M Klimek; University of California Irvine: N Hermanowicz, S Niswonger; University of California San Diego: C Shults (deceased), D Fontaine; University of California San Francisco: M Aminoff, C Christine, M Diminno, J Hevezi; University of Chicago: A Dalvi, U Kang, J Richman, S Uy, J Young; University of Cincinnati: A Dalvi, A Sahay, M Gartner, D Schwieterman; University of Colorado Health Sciences Center: D Hall, M Leehey, S Culver, T Derian; University of Connecticut: T Demarcaida, S Thurlow; University of Iowa: R Rodnitzky, J Dobson; University of Kansas Medical Center: K Lyons, R Pahwa, T Gales, S Thomas; University of Maryland School of Medicine: L Shulman, S Reich, W Weiner, K Dustin; University of Miami: K Lyons, C Singer, W Koller (deceased), W Weiner, L Zelaya; University of Minnesota: P Tuite, V Hagen, S Rolandelli, R Schacherer, J Kosowicz; University of New Mexico: P Gordon, J Werner; University of Puerto Rico School of Medicine: C Serrano, S Roque; University of Rochester: R Kurlan, D Berry, I Gardiner; University of South Florida: R Hauser, J Sanchez-Ramos, T Zesiewicz, H Delgado, K Price, P Rodriguez, S Wolfrath; University of Tennessee Health Science Center: R Pfeiffer, L Davis, B Pfeiffer; University of Texas Southwestern Medical Center: R Dewey, B Hayward, A Johnson, M Meacham, B Estes; Wake Forest University School of Medicine: F Walker, V Hunt, C O'Neill; Washington University: B Racette, L Swisher.

23andMe

Nicholas Eriksson, Cheri Dijamco, Emily M Drabant, Elizabeth Dorfman, Joyce Y Tung, David A Hinds, Joanna L Mountain, Anne Wojcicki. 23andMe, Mountain View California, USA.

PD Gene Database

Christina Lill - Neuropsychiatric Genetics Group, Department of Vertebrate Genomics, Max

Planck Institute for Molecular Genetics, Berlin, Germany and Department of Neurology, Focus

Program Translational Neuroscience, University Medical Center of the Johannes

Gutenberg University Mainz, Mainz, Germany. Lars Bertram - Neuropsychiatric Genetics

Group, Department of Vertebrate Genomics, Max Planck Institute for Molecular Genetics, Berlin,

Germany.

GenePD Investigators and Coordinators: University Southern California School of Medicine: M Lew; University of Calgary: O Suchowersky; University of Lübeck, Germany: C Klein; UMDNJ-Robert Wood Johnson Medical School: L Golbe, MH Mark; Massachusetts General Hospital, Harvard Medical School: J Growdon, N Huggins; University of Virginia Health System: GF Wooten; University of Alabama at Birmingham: R Watts; University of Toronto: M Guttman; Washington University School of Medicine: B Racette, J Perlmutter; Barrow Neurological Institute: L Marlor; Sun Health Research Institute: H Shill; University of Miami: C Singer; Parkinson Institute, Istituti Clinici di Perfezionamento, Milano, Italy: S Goldwurm, G Pezzoli; Boston University School of Medicine: MH Saint-Hilaire, T Massood; Cleveland Clinic Foundation: K Baker, I Itin; University of Louisville School of Medicine: I Litvan; University of Sydney ANZAC Research Institute, Concord Hospital, Sydney, Australia: G Nicholson, A Corbett; Struthers Parkinson's Center, Minneapolis: M Nance; Port City Neurology, Scarborough, ME: E Drasby; Parkinson's Disease and Movement Disorder Center of Boca Raton: S Isaacson: Newcastle University, Newcastle upon Tyne, UK: D Burn, P Chinnery; General Regional Hospital Bolzano, Bolzano, Italy: P Pramstaller; University of Arkansas for Medical Sciences: J Al-hinti; Aarhus University Hospital, Aarhus, Denmark: A Moller, K Ostergaard; University of Arizona: S Sherman; Auckland City Hospital, Auckland, New Zealand: R Roxburgh, B Snow; University of Kentucky College of Medicine: J Slevin, F Cambi.

NGRC Investigators and Coordinators: New York State Department of Health Wadsworth Center: D Kay, J Montimurro, V Kusel; VA Puget Sound Health Care System and University of Washington: A Samii, E Martinez, D Yearout; Oregon Health and Sciences University: J Nutt; Evergreen Hospital Medical Center: P Agarwal, A Griffith; Virginia Mason Medical Center: JW Roberts; Samuel Stratton VA Medical Center and Albany Medical Center: DS Higgins. Albany Medical Center: Eric Molho, Emory University: Ami Rosen.

The Ashkenazi Jewish Dataset

The Ashkenazi Jewish dataset Investigators: LN Clark (Department of Pathology and Cell Biology and the Taub Institute for Alzheimer's Disease and the Aging Brain, Columbia University Medical Center), X Liu Department of Pathology and Cell Biology, Columbia University Medical Center, JH Lee (Taub Institute for Alzheimer's Disease and the Aging Brain, Columbia University Medical Center), R Cheng (Taub Institute for Alzheimer's Disease and the Aging Brain, Columbia University Medical Center), K Marder (Department of Neurology, Gertrude H Sergievsky Center and Taub Institute for Alzheimer's Disease and the Aging Brain, Columbia University Medical Center), ED Louis ((Department of Neurology, Gertrude H Sergievsky Center and Taub Institute for Alzheimer's Disease and the Aging Brain, Columbia University Medical Center), LJ Cote (Department of Neurology, Gertrude H Sergievsky Center and Taub Institute for Alzheimer's Disease and the Aging Brain, Columbia University Medical Center), C Waters (Department of Neurology, Columbia University Medical Center), B Ford (Department of Neurology, Columbia University Medical Center), and S Fahn (Department of Neurology, Columbia University Medical Center).

HIHG Investigators and Coordinators: Miami Udall PD Research Center of Excellence, John P. Hussman Institute for Human Genomics (HIHG), University of Miami Miller School of Medicine, Miami FL, USA: Jeffery M. Vance, Gary W. Beecham, Eden R. Martin, Karen Nuytemans, Margaret A. Pericak-Vance. Center for Human Genetics Research, Vanderbilt University Medical Center, Nashville TN, USA: Jonathan L. Haines. Some of the samples used in this study were collected while Drs. Vance, Scott, Martin and Pericak-Vance were faculty members at Duke University.

CHARGE

Anita DeStefano^{1–3}, Sudha Seshadri³, Seung Hoan Choi³, Samuel Frank³, Joshua C. Bis⁴, Bruce M Psaty^{5–7}, Kenneth Rice⁸, WT Longstreth, Jr^{5,9}, Thanh G.N. Ton⁹, Samay Jain¹⁰, M. Arfan Ikram^{11–13}, Cornelia M. van Duijn¹¹, Albert Hofman¹¹, Andre Uitterlinden¹⁴, Vincent Verlinden¹¹, Peter J. Koudstaal¹³

- 1. Department of Neurology, Boston University School of Medicine, Boston, MA, USA.
- Department of Biostatistics, Boston University School of Public Health, Boston, MA
 02118, USA.
- 3. NHLBI's Framingham Heart Study, Framingham, MA, USA.
- 4. Cardiovascular Health Research Unit, Department of Medicine, University of Washington, Seattle, WA.
- 5. Department of Epidemiology, University of Washington, Seattle, WA.
- Department of Health Services, University of Washington, Seattle, WA.
- 7. Group Health Research Institute, Group Health Cooperative, Seattle, WA.
- 8. Department of Biostatistics, University of Washington, Seattle, WA 8195-9460.

- 9. Department of Neurology, University of Washington, Seattle, WA, USA.
- 10. Cardiovascular Health Study, Department of Neurology, University of Pittsburgh, Pittsburgh, PA, USA.
- 11. Department of Epidemiology, Erasmus MC University Medical Center, Rotterdam, the Netherlands.
- 12. Department of Radiology, Erasmus MC University Medical Center, Rotterdam, the Netherlands.
- 13. Department of Neurology, Erasmus MC University Medical Center, Rotterdam, the Netherlands.
- 14. Department of Internal Medicine, Erasmus MC University Medical Center, Rotterdam, the Netherlands.

Greek Parkinson's Disease Consortium

Eleanna Kara¹, Georgia Xiromerisiou^{2,3}, Efthimios Dardiotis², Vana Tsimourtou⁴, Cleanthe Spanaki⁵, Andreas Plaitakis⁵, Maria Bozi⁶⁻⁸, Leonidas Stefanis^{8,9}, Dimitris Vassilatis¹⁰, Georgios Koutsis¹¹, Marios Panas¹¹, Henry Houlden¹, Georgios M. Hadjigeorgiou²

- Department of Molecular Neuroscience, Institute of Neurology, University College London, London, United Kingdom, WC1N 3BG.
- 2. Neuroscience Unit, Department of Neurology, Faculty of Medicine, University of Thessaly, Greece.
- 3. Department of Neurology, Papageorgiou Hospital, Thessaloniki, Greece.
- 4. Department of Neurology, University Hospital of Larissa, Greece.
- 5. Department of Neurology, Medical School, University of Crete, Heraklion, Crete.

- 6. Hygeia Hospital, Clinic of Neurodegenerative Disorders, Athens, Greece.
- 7. General Hospital of Syros, Syros, Greece.
- 8. Second Department of Neurology, National and Kapodistrian University of Athens Medical School, Athens, Greece.
- 9. Division of Basic Neurosciences, Biomedical Research Foundation of the Academy of Athens, Athens, Greece.
- Division of Cell Biology, Biomedical Research Foundation of the Academy of Athens,
 Athens, Greece.
- 11. Neurogenetics Unit, 1st Department of Neurology, University of Athens Medical School, Eginition Hospital, Athens, Greece.

The Alzheimer Genetic Analysis Group Investigators are:

Rita Guerreiro¹, Jose Bras¹, Katie Lunnon², Michelle Lupton², John Powell², Laura Parkkinen³, Olaf Ansorge^{3,4}, John Hardy¹

- 1. Reta Lila Weston Institute and Department of Molecular Neuroscience, University College London Institute of Neurology, Queen Square, London, United Kingdom, WC1N 3BG
- 2. Department of Neuroscience, King's College London Institute of Psychiatry, London, UK
- Oxford Parkinson's Disease Centre, Nuffield Department of Clinical Neurosciences, University of Oxford, UK
- Department of Neuropathology, Nuffield Department of Clinical
 Neurosciences, University of Oxford, John Radcliffe Hospital, OX3 9DU.